means for removing heat from said heat transfer fluid.

Please add new claims 22 and 23.

--22. (New) The cooling apparatus according to claim 1 wherein:

said cooling apparatus is affixed to a printed circuit board for cooling said heat generating component.--

--23. (New) The cooling apparatus according to claim 8 wherein:

said cooling apparatus is affixed to a printed circuit board for cooling said heat generating component.--

REMARKS

The Applicant notes the Examiner's acknowledgment of Applicant's election of species A as illustrated in Figure 1. The Examiner has withdrawn claims 5, 7 and 12-20 from further consideration as being drawn to a nonelected species. The Examiner has rejected claims 1-13 and 21. Claims 1, 2, 4, 6, 7, 8, 10 and 21 have been amended. New claims 22 and 23 have been added. Claims 1-13 and 21-23 remain for consideration.

Claim rejections - 35 USC §103

Fox et al. (USPN 5,285,347) in view of Hamilton et al. (5,901,037)

The Examiner has rejected claims 1-3, 6, 8-11 and 21 as being unpatentable over Fox et al. in view of Hamilton et al. The Examiner states that the patent of Fox et al. in figures 1-6 discloses all the claimed features of the invention with the exception of the channels being micro-channels and inlet and outlet end caps. The Examiner further stated that, "method of manufacturing limitations (i.e. molding, extruding, etc.) are not given any patentable weight in an apparatus claim.

The Examiner states that the patent of Hamilton et al. in Figures 12-13 discloses a heat exchanger having a plurality of micro-channels and inlet and outlet end caps for the purpose of increasing the heat transfer rate away from an electronic device and increasing the heat transfer efficiency of the heat exchanger.

The Examiner concludes that, "It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Fox et al. the heat exchanger having a plurality of microchannels and inlet and outlet end caps for the purpose of increasing the heat transfer rate away from an electronic device and increasing the heat transfer efficiency of the heat exchanger as disclosed in Hamilton et al.

Regarding claim 1, claim has been amended to add the limitation of :

A cooling apparatus . . . comprising:

a low profile metal [extrusion] <u>unitary member</u> having a first exterior [extrusion] surface adapted for receiving heat from the at least one heat

generating component and a plurality of micro tubes having a flattened heat transfer surface, said low profile metal unitary member having [with] a micro tube inlet and a micro tube outlet, said low profile metal [extrusion] unitary member providing an entirely metallic thermal path for conducting heat from said first exterior [extrusion] surface to a heat transfer fluid contained within said plurality of micro tubes;

The term "extrusion" has been deleted due to the Examiner's statement that such limitations are not given any patentable weight in an apparatus claim. The limitation, "unitary member" has been added to the claim to claim the advantageous nature of the extruded part, which makes possible a low profile and other advantages. Additionally, the limitation that the, "plurality of micro tubes having a flattened heat transfer surface" has been added to further distinguish claim 1 over the cited art.

Fox et al. teaches a hybrid heat sink 20 to be placed in direct physical contact with an electronic component 14 as is shown in figures 1 and 2 (see col. 5, lines26-28). Heat sink 20 may be manufactured by a casting process wherein heat sink 20 is cast in two sections that are joined along line 40 (see col. 5, lines 48-51). In an alternate configuration, shown in figure 2, the hybrid heat sink could be manufactured by drilling holes 80, 82, 84, and 86 through the body of the hybrid heat sink 20. Fittings 60, 62, 64, 66, 68, 70, 72 and 74are attached by brazing or welding. Flexible tubing 90 is then attached to the fittings, thereby allowing a path of the fluid to flow through the hybrid heat sink 20.

In either embodiment of the heat sink 20 taught in Fox et al., the heat sink 20 is not

comprised of a unitary member with micro tubes having a flattened heat transfer surface as is claimed in amended claim 1. In the first embodiment, heat sink 20 is cast in two sections, which are joined along line 40. Cavity 16 appears to have a circular cross-section in Figure 1. Additionally, the heat sink 20 is not comprised of a unitary member, but instead is bifurcated so that the cavity 16 may form a passageway when the two sections are mated along line 40.

In the alternate embodiment shown in Figure 2, the heat sink 20 is comprised of a unitary member, but the passageways are formed by drilling holes 80, 82, 84, and 86 through the body of the heat sink 20 (col. 5, lines 57 and 58). Since holes 80, 82, 84, and 86 are drilled, the holes must have a circular cross section.

Hamilton et al. teaches a micro channel cooled high power RF transistor amplifier module 10 (figure 10) comprised of a substrate 14 including a plurality of parallel micro channel grooves 16 that form micro channels when substrate 14 is mated up with channel closure member 26. Hamilton does not teach a unitary member as is claimed in amended claim 1.

Neither Fox et al. nor Hamilton et al. teach or suggest, alone or in combination, a unitary member with micro tubes having a flattened heat transfer surface as is claimed in amended claim 1. The unitary construction of applicant's low profile metal extrusion allows for the construction of a member having a thin profile, which may be necessary for use in electronics applications. The flattened heat transfer surfaces of the micro tubes allow for increased heat transfer through the resulting thin walls. Drilled circular micro tubes, as taught in Fox et al. result in extra material and reduced heat transfer characteristics for a similarly sized cooling apparatus as compared to the cooling apparatus of the applicant. Neither Fox et al. nor Hamilton et al. suggest the

combination of flattened heat transfer surfaces of microtubes within a unitary cooling member. In fact, such a combination would not be possible utilizing the teachings of the patents.

Regarding dependent claim 2, dependent claim 2 has been amended to replace "low profile metal extrusion" with "low profile metal unitary member" to conform with the amended language of independent claim 1. Dependent claim 2 depends from independent claim 1, which is submitted to be patentable. Dependent claim 2 is, therefore, submitted to be patentable for at least this reason.

Regarding dependent claim 3, dependent claim 3 depends from dependent claim 2, which depends from independent claim 1, which is submitted to be patentable. Dependent claim 3 is, therefore submitted to be patentable for at least this reason.

Regarding dependent claim 6, dependent claim 6 has been amended to replace "low profile metal extrusion" with "low profile metal unitary member" to conform with the amended language of independent claim 1. Dependent claim 6 depends from independent claim 1, which is submitted to be patentable. Dependent claim 6 is, therefore, submitted to be patentable for at least this reason.

Regarding independent claim 8, independent claim 8 is patentable over the cited references for at least the reasons set forth with respect to independent claim 1, above. Note that several elements of claim 8 have been deleted.

Regarding dependent claim 9, dependent claim 9 depends from independent claim 8, which is submitted to be patentable. Dependent claim 9 is, therefore submitted to be patentable for at least this reason.

Regarding dependent claim 10, dependent claim 10 has been amended to replace "low profile metal extrusion" with "low profile metal unitary member" to conform with the amended language of independent claim 8. Dependent claim 10 depends from independent claim 8, which is submitted to be patentable. Dependent claim 10 is, therefore, submitted to be patentable for at least this reason.

Regarding dependent claim 11, dependent claim 11 depends from dependent claim 10, which depends from independent claim 8, which is submitted to be patentable. Dependent claim 11 is, therefore submitted to be patentable for at least this reason.

Regarding independent claim 21, independent claim 21 is patentable over the cited references for at least the reasons set forth with respect to independent claim 1, above.

Claim rejections - 35 USC §103

Fox et al. (USPN 5,285,347) in view of Hamilton et al. (5,901,037) further in view of known/convention prior art

The Examiner has rejected claim 4, "as being unpatentable over Fox et al. in view of Hamilton et al. as applied to claims 1-3, 6, 8-11 and 21 above, and further in view of applicant's omission of know/convention prior art." The Examiner states that,

> "applicant's omission of known/convention prior art in his specification on page 7 discloses that it is know to have a second material between the heat exchanger and the component of the purpose of reducing thermal resistance and attaching the component to the heat exchanger. The material being metal is considered to be an

obvious design expedient. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Fox et al. as modified, a second material between the heat exchanger and the component for the purpose of reducing thermal resistance and attaching the component to the heat exchanger as known by applicant's omission of known/convention prior art."

Regarding dependent claim 4, dependent claim 4 has been amended to replace "low profile metal extrusion" with "low profile metal unitary member" to conform with the amended language of independent claim 1. Dependent claim 4 depends from independent claim 1, which is submitted to be patentable. Dependent claim 4 is, therefore, submitted to be patentable for at least this reason.

REMARKS

Favorable reconsideration of the above-identified application, as presently amended, is respectfully requested.

In view of the foregoing, Applicant respectfully requests the thorough reconsideration of this application and earnestly solicits an early notice of allowance.

Respectfully submitted,

JENKENS & GILCHRIST,
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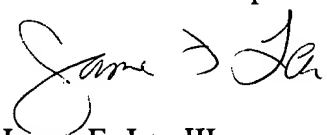

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